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(54) SEMICONDUCTOR CIRCUIT BOARD AND SEMICONDUCTOR DEVICE

(57) Abstract:

PROBLEM TO BE SOLVED: To provide a semiconductor circuit board which allows the firm fixation of a thin semiconductor chip to itself without damaging the semiconductor chip.

SOLUTION: On the surface of a copper electrode 2 of a semiconductor circuit board, a projecting section 6 is formed which is consistent in shape with a rear face of a thin semiconductor chip 4 whose surface is warped upwards. By fastening the rear face of the semiconductor chip 4 to the projecting section 6 via solder 3, the solder can be free of void and the semiconductor chip 4 is never damaged by a pressurizing force applied at the time of bonding. Furthermore, there is no increase in heat resistance which could be caused by the void of the solder, and the resistance to a power cycle of the semiconductor chip 4 can also be improved.

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CLAIMS

[Claim(s)]

[Claim 1]The semi-conductor circuit board characterized by making the shape of surface type of said electric conduction film of the part which a semiconductor chip fixes into the convex form or concave doubled with the curvature of said semiconductor chip in the semi-conductor circuit board which the electric conduction film by which pattern formation was carried out fixes to an insulating substrate.

[Claim 2]The semi-conductor circuit board according to claim 1 which makes said insulating substrate a convex form or a concave for the configuration of said convex type or a concave, and is characterized by forming by fixing said electric conduction film of the same thickness on this insulating substrate.

[Claim 3]The semi-conductor circuit board according to claim 1 which makes only said electric conduction film a convex form or a concave for the configuration of said convex type or a concave, and is characterized by the root face of this electric conduction film and said insulating substrate being flat.

[Claim 4]The semi-conductor circuit board according to claim 1 to 3 characterized by forming ***** in the electric conduction film around the part which said semiconductor chip fixes.

[Claim 5]The semiconductor device characterized by fixing a semiconductor chip through solder in the semi-conductor fixing part of said convex type or a concave using said semi-conductor circuit board according to claim 1 to 4.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]the condition which curved the semiconductor chip in the condition that this invention curved -- it is related with the semiconductor device using the semi-conductor circuit board whose junction was enabled [remaining as it is and], and its semi-conductor substrate.

[0002]

[Description of the Prior Art]Drawing 6 is the important section sectional view of the conventional semi-conductor circuit board which fixed the semiconductor chip. A semiconductor chip 4 is joined to the semi-conductor circuit board which consists of a copper electrode 2 which are an insulating substrate 1 and a current carrying part through solder 3 (fixing). As a semiconductor chip 4 is shown in drawing 8, the rear-face metal membranes 102, such as a three-layer metal membrane of aluminum/nickel/Au, are formed in a rear face with the semi-conductor substrate 100 and the insulator layers 101, such as polyimide film alternatively covered on a front face. By these insulator layers 101 and rear-face metal membranes 102, the difference of a coefficient of thermal expansion with the semi-conductor substrate 100, and the thickness of these film, a semiconductor chip 4 curves in convex, or curves in a concave. With 10mm**, extent, the amount of curvatures consists of 0.1mm order also before and after 0.2mm with the semiconductor chip 4 with a thickness of 50 to about 100 micrometers. Usually, since the coefficient of thermal expansion is larger than the semi-conductor substrate 100, if the polyimide film and a three-layer metal membrane cover the insulator layers 101, such as polyimide, on a front face, and a front face will cover curvature to a concave and will cover the metal membranes 102, such as a three-layer metal membrane, at the rear face, a concave, i.e., a front face, will curve [a rear face] in convex. From polyimide, since the

direction of a three-layer metal membrane has the large coefficient of thermal expansion, it curves so that a front face may usually become convex.

[0003] As shown in drawing 6, when it curves in convex, an opening 5 may be made in the center section of the solder 3 between a copper electrode 2 and a semiconductor chip 4. If this is in a condition as it is and puts the semiconductor chip 4 which curved in convex on the solder 3 of the shape of a solid or a paste, since it cannot finish escaping from this air even if it fuses solder and joins a copper electrode 2 to a semiconductor chip 4, an opening 5 will be formed in a center section, an air space being formed in the center section in which a semiconductor chip 4 and solder 3 do not contact, being in that condition, and carrying out vacuum suction.

[0004] Moreover, opening 5a which is the part where solder 3 is not attached to the edge of a semiconductor chip 4 when the semiconductor chip 4 has curved in the concave, as shown in drawing 7 arises, and it is *****.

[0005]

[Problem(s) to be Solved by the Invention] The stress to which it tends to make a semiconductor chip 4 flat if compulsory welding pressure, such as wirebonding, joins these openings 5 and 5a may be added, and, in any case, the damage 20 on a crack, a cave-in, etc. may arise in a semiconductor chip 4. Moreover, if there are openings 5 and 5a even when a semiconductor chip 4 is assembled without damage, thermal resistance will become high in this part, the temperature rise of a semiconductor chip 4 will become large, and a power cycle tolerated dose will fall.

[0006] The purpose of this invention is to solve the aforementioned technical problem and offer the semi-conductor circuit board and the semiconductor device which can fix a semiconductor chip, without making a thin semiconductor chip produce damage.

[0007]

[Means for Solving the Problem] In order to attain the purpose of this invention, in the semi-conductor circuit board which the electric conduction film (copper electrode) by which pattern formation was carried out fixes to an insulating substrate, it considers as the configuration which makes the shape of surface type of said electric conduction film of the part which a semiconductor chip fixes the convex form or concave doubled with the curvature of said semiconductor chip.

[0008] Moreover, only said electric conduction film is made into a convex form or a concave for the configuration of said convex type or a concave, and the root face of this electric conduction film and said insulating substrate is made flat. Moreover, it is good to make said insulating substrate into a convex form or a concave for the configuration of said convex type or a concave, and to fix said electric conduction film of the same thickness on this insulating substrate. Moreover, it is good for the electric conduction film around said semiconductor chip to form ***** (pit).

[0009] Moreover, using the aforementioned semi-conductor circuit board, a semiconductor chip is fixed through solder in the semi-conductor fixing part of said convex type or a concave, and it considers as a semiconductor device. As mentioned above, without producing the opening of the solder section, even if the semiconductor chip has curved in convex or a concave by making into convex or a concave the surface part of the copper electrode which joins a semiconductor chip, it becomes joinable to a copper electrode all over a semiconductor chip, and junction dependability also with an expensive thin semiconductor chip can be realized.

[0010] Moreover, it can prevent that a semiconductor chip short-circuits by the end face with excessive solder by preparing a pit.

[0011]

[Embodiment of the Invention] The following explanation described the same sign in the same part as drawing 6. Drawing 1 is the important section sectional view of the semi-conductor circuit board of the 1st example of this invention. This

drawing is a sectional view which fixed the semiconductor chip 4 with a thickness of 100 micrometers or less, and the front face of the copper electrode 2 which touches through the rear face and solder 3 of a semiconductor chip 4 serves as convex. As shown in aforementioned drawing 8, the insulator layers 101, such as polyimide, were formed in the front face of the semi-conductor substrate 100, the rear-face metal membranes 102, such as three-layer vacuum evaporationo film of aluminum/nickel/Au, were formed in the rear face, and, as for the semiconductor chip 4, the front face has usually curved in convex (it is curving).

[0012]The front face of the copper electrode 2 which joins the semiconductor chip 4 which curved in convex [this] with solder 3 incurvates convex. This curved field is acquired by forming the height 6 in the front face of an insulating substrate 1, and forming the copper electrode 2 of uniform thickness on it. Moreover, this curved field forms the height in the front face of a copper electrode 2 so that the field which curved in the concave of the rear face of a semiconductor chip 4 may be exactly contacted according to the average curvature condition of a semiconductor chip 4.

[0013]The semiconductor chip 4 which curved is joined through solder 3 along this curve side. Since the condition of the front face of the copper electrode 2 which is in the inferior-surface-of-tongue side to which a semiconductor chip 4 is joined at this time is made like the condition of the curvature of a semiconductor chip 4, even if an opening 5 is not generated in the solder 3 which has joined the copper electrode 2 to the semiconductor chip 4 at the time of a soldered joint but it performs wire bonding which is not illustrated, a semiconductor chip 4 is not damaged.

[0014]Furthermore, since it has joined by the whole surface product of a semiconductor chip 4, a power cycle tolerated dose also improves. After the semi-conductor substrate shown in drawing 1 places a daily dose so that the inferior surface of tongue used as the pair of the convex configuration of the front face of an insulating substrate 1 may serve as the circuit board of predetermined thickness between these two metal mold in the ceramic powder which is a raw material using two, concave metal mold and metal mold with an even front face, it is calcinated and formed at a predetermined pressure and predetermined temperature. Then, a front face puts on the ceramic plate which became a concave, and joins at a predetermined pressure and predetermined temperature. Generally an alumina, nitriding aluminum, etc. are used for junction of a ceramic plate and copper foil as a jointing material for corrugated fibreboard.

[0015]Drawing 2 is the important section sectional view of the semi-conductor circuit board of the 2nd example of this invention. The difference from drawing 1 is the point of having formed the height 7 in the front face of the copper electrode 2 which there is no height 6 in the insulating substrate 1 used as a foundation, and is installed in the upper part. Also in this case, the same effectiveness as drawing 1 is acquired. The top face and the inferior surface of tongue create the ceramic plate with even metal mold, and the semi-conductor circuit board shown in drawing 2 puts copper foil on a ceramic plate with this even front face, and joins a ceramic plate for even metal mold to copper foil at Mr. arrangement, and a predetermined pressure and predetermined temperature at another [which does not put copper foil] ceramic plate surface from the metal mold side where the concave crater was formed in the field which touches copper foil. By carrying out like this, the copper electrode 2 with a convex configuration is formed.

[0016]Drawing 3 is the important section sectional view of the semi-conductor circuit board of the 3rd example of this invention. This semi-conductor circuit board makes a concave the insulating substrate 1 shown by drawing 1 $R > 1$, and the height 6 of a copper electrode 2. This is applied when the semiconductor chip 4 has curved in the concave. Also in this case, the same effectiveness as drawing 1 is acquired. Like the manufacture approach of the semi-conductor circuit board shown by drawing 1, the semi-conductor circuit board shown in drawing 3 is manufactured because the inferior surface of tongue used as the concave

configuration of the front face of an insulating substrate 1 and a pair uses concave metal mold.

[0017] Drawing 4 is the important section sectional view of the semi-conductor circuit board of the 4th example of this invention. This semi-conductor circuit board makes a concave the height 7 of a copper electrode 2 shown by drawing 2 R> 2. Also in this case, the same effectiveness as drawing 2 is acquired. Like the manufacture approach of the semi-conductor circuit board shown by drawing 2, the semi-conductor circuit board shown in drawing 4 is manufactured because the inferior surface of tongue used as the convex configuration of the front face of an insulating substrate 1 and a pair uses convex metal mold.

[0018] Drawing 5 is the important section sectional view of the semi-conductor circuit board of the 5th example of this invention. Although this semi-conductor circuit board is the same configuration as the semi-conductor circuit board of drawing 1 fundamentally, it has installed the pit 10 (******) which slushes excessive solder 3a into the periphery section of the part which joins a semiconductor chip 4. As excessive solder 3a shows in a flash and drawing by the dotted line to the periphery section and the chip front face of a semiconductor chip 4, this pit 10 has the work which prevents connecting too hastily in the periphery section, and can raise dependability.

[0019] Although installed in the periphery section of the part which joins a semiconductor chip 4, this pit 10 designs the dimension of its depth and width of face so that the solder which it was various and was protruded with the amount of the surface area and the solder of a semiconductor chip 4 may not overflow from a pit 10. Moreover, this pit 10 may be established only in the front face of a copper electrode 2, and if a still deeper pit is required, it will not matter as illustrated, even if it reaches to the insulating substrate 1 located in the lower part of a copper electrode 2.

[0020] Moreover, this pit is preparing also in drawing 4 from drawing 2, and the same effectiveness is acquired.

[0021]

[Effect of the Invention] According to this invention, according to the curvature of a semiconductor chip, incurvate a copper electrode, an opening becomes impossible between a semiconductor chip and solder by joining by solder, and damage on a semiconductor chip can be prevented with the welding pressure at the time of wirebonding. Moreover, since there is no opening, thermal resistance does not increase but a power cycle tolerated dose improves.

[0022] Furthermore, by installing the pit which slushes surplus solder into the copper electrode or copper electrode which joins a semiconductor chip, and an insulating substrate, the tolerated dose to the thermal stress at the time of chip actuation can improve, and high junction dependability can be acquired.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The important section sectional view of the semi-conductor circuit board which the semiconductor chip of the 1st example of this invention fixed

[Drawing 2] The important section sectional view of the semi-conductor circuit board which the semiconductor chip of the 2nd example of this invention fixed

[Drawing 3] The important section sectional view of the semi-conductor circuit board which the semiconductor chip of the 3rd example of this invention fixed

[Drawing 4] The important section sectional view of the semi-conductor circuit board which the semiconductor chip of the 4th example of this invention fixed

[Drawing 5] The important section sectional view of the semi-conductor circuit board which the semiconductor chip of the 5th example of this invention fixed

[Drawing 6] The important section sectional view of the semi-conductor circuit board which the semiconductor chip which curved in convex [conventional] fixed

[Drawing 7] The important section sectional view of the semi-conductor circuit board which the semiconductor chip which curved in the conventional concave fixed

[Drawing 8] The important section sectional view of the semiconductor chip which curved

[Description of Notations]

1 Insulating Substrate

2 Copper Electrode

3 Solder

3a Excessive solder

4 Semiconductor Chip

5 5a Opening

6 Height Given to Insulating Substrate 1

7 Height Given to Copper Electrode 2

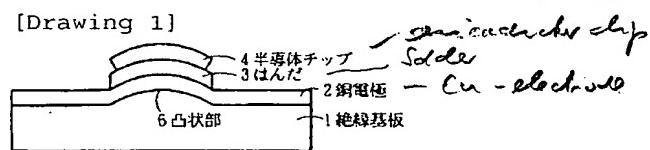
8 Concave Section Given to Insulating Substrate

9 Concave Section Given to Copper Electrode 2

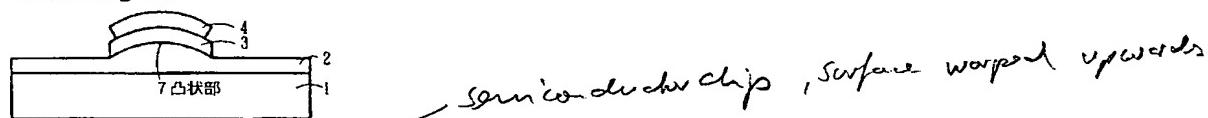
10 Pit

DRAWINGS

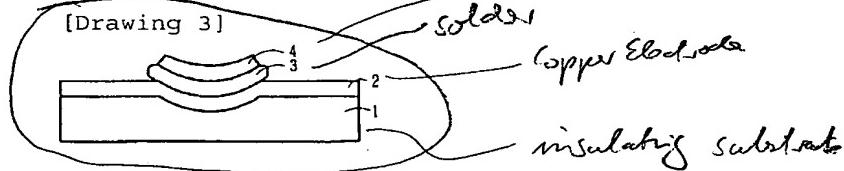
[Drawing 1]



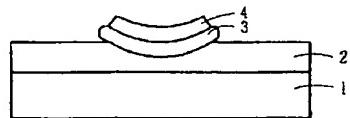
[Drawing 2]



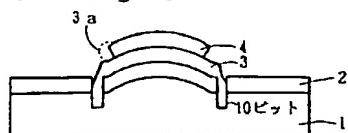
[Drawing 3]



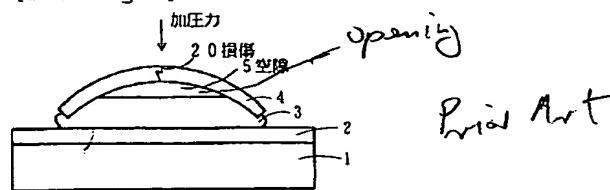
[Drawing 4]



[Drawing 5]

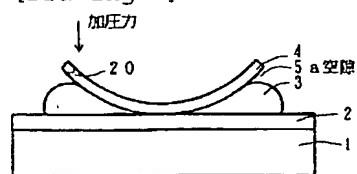


[Drawing 6]

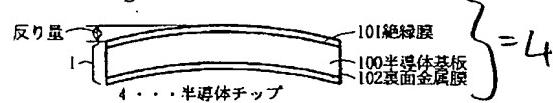


Prelim Art

[Drawing 7]



[Drawing 8]



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Translated: 23:26:42 JST 05/10/2005

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CLAIMS

Claim(s)]

Claim 1] The semiconductor circuit board characterized by making the shape of surface type of said electric conduction layer of the art which a semiconductor chip fixes into the convex form or concave doubled with the curvature of said semiconductor chip in the semiconductor circuit board which the electric conduction layer by which pattern formation was carried out fixes in an insulating substrate.

Claim 2] The semiconductor circuit board according to claim 1 which makes said insulating substrate a convex form or a concave for the configuration of said convex type or a concave, and is characterized by forming by fixing said electric conduction layer of the same thickness on this insulating substrate.

Claim 3] The semiconductor circuit board according to claim 1 which makes only said electric conduction layer a convex form or a concave for the configuration of said convex type or a concave, and is characterized by the root face of this electric conduction layer and said insulating substrate being flat.

Claim 4] The semiconductor circuit board according to claim 1 to 3 characterized by forming ***** in the electric conduction layer round the part which said semiconductor chip fixes.

Claim 5] The semiconductor device characterized by fixing a semiconductor chip through solder in the semiconductor fixing part of said convex type or a concave using said semiconductor circuit board according to claim 1 to 4.

DETAILED DESCRIPTION

Detailed Description of the Invention]

[001]

[Field of the Invention] the state which curved the semiconductor chip in the state where this invention curved — it is related with the semiconductor device using the semiconductor circuit board whose junction was enabled [remaining as it is and], and its semiconductor substrate.

[002]

[Description of the Prior Art] Drawing 6 is the important section sectional view of the conventional semiconductor circuit board which fixed the semiconductor chip. The semiconductor chip 4 is joined to the semiconductor circuit board which consists of a copper electrode 2 which are the insulating substrate 1 and a conductive part through solder 3 (fixing). As the semiconductor chip 4 is shown in drawing 8 , the rear-face metal membranes 102, such as a three-layer metal membrane of aluminum/nickel/Au, are formed in the semiconductor substrate 100, the insulator layers 101, such as a polyimide layer selectively covered on the surface, and a rear face. By these insulator layers 101 and rear-face metal membranes 102, the difference of a coefficient of thermal expansion with the semiconductor substrate 100, and the thickness of these layers, the semiconductor chip 4 curves in convex, or curves in a concave. By 0mm** intensity, the amount of curvatures is set to around 0.2mm from around 0.1mm with the semiconductor chip 4 50 to about 100 micrometers thick. Usually, since a polyimide layer and a three-layer metal membrane is [the coefficient of thermal expansion] larger than the semiconductor substrate 100, if the insulator layers 101, such as polyimide, are covered on the surface, and the surface will over curvature to a concave and will cover the metal membranes 102, such as a three-layer metal membrane, at the rear face, a concave, i.e., the surface, will curve [a rear face] in convex. From polyimide, since the direction of a three-layer metal membrane has a large coefficient of thermal expansion, it curves so that the surface may usually become convex.

[003] As shown in drawing 6 , when it curves in convex, an opening 5 may be made in the center section of the solder 3 between the copper electrode 2 and the semiconductor chip 4. When this is in a state as it is and the semiconductor chip 4 which curved in convex is put on a solid or the paste state solder 3, an air layer is formed in the center section in which the semiconductor chip 4 and solder 3 do not contact, and it is in the state. Since it cannot finish escaping from this air even if it fuses solder and joins the copper electrode 2 to the semiconductor chip 4, carrying out vacuum suction, an opening 5 is formed in a center section.

[004] Moreover, the opening 5a which is the part where solder 3 is not attached to the edge of the semiconductor chip 4 when the semiconductor chip 4 has curved in the concave, as shown in drawing 7 arises, and it is *****.

[005]

[Problem to be solved by the invention] In any case, when compulsory welding pressure, such as wirebonding, is added to this opening 5 and 5a, the stress which is going to make the semiconductor chip 4 flat may be added, and the breakage 20 to a crack, a cave-in, etc. may arise in the semiconductor chip 4. Moreover, if there are an opening 5 and 5a even when the semiconductor chip 4 is assembled without breakage, thermal resistance will become high in this part, the temperature rise of the semiconductor chip 4 will become large, and a power cycle tolerated dose will fall.

[006] The object of this invention is to solve the aforementioned technical problem and to offer the semiconductor circuit board and the semiconductor device which can fix a semiconductor chip, without making a thin semiconductor chip produce breakage.

[007]

[Means for solving problem] In order to attain the object of this invention, the electric conduction layer (copper electrode) by which attern formation was carried out considers the shape of surface type of said electric conduction layer of the part which a semiconductor chip fixes in the semiconductor circuit board which fixes in an insulating substrate as the composition made into the convex form or concave doubled with the curvature of said semiconductor chip.

1008] Moreover, only said electric conduction layer is made into a convex form or a concave for the configuration of said convex type or a concave, and the root face of this electric conduction layer and said insulating substrate is made flat. Moreover, it is good to make aid insulating substrate into a convex form or a concave for the configuration of said convex type or a concave, and to fix said electric conduction layer of the same thickness on this insulating substrate. Moreover, it is good for the electric conduction layer around said semiconductor chip to form ***** (pit).

1009] Moreover, using the aforementioned semiconductor circuit board, a semiconductor chip is fixed through solder in the semiconductor fixing part of said convex type or a concave, and it is considered as a semiconductor device. As mentioned above, by taking into convex or a concave the surface portion of the copper electrode which joins a semiconductor chip Without producing the pening of the solder section, even if the semiconductor chip has curved in convex or a concave, it becomes joinable to a copper electrode all over a semiconductor chip, and joining reliability also with an expensive thin semiconductor chip can be realized.

1010] Moreover, it can prevent that a semiconductor chip short-circuits by an end face with excessive solder by preparing a pit.

1011]

[Mode for carrying out the invention] The following discussion described the same sign in the same part as drawing 6 . Drawing 1 is the important section sectional view of the semiconductor circuit board of the 1st example of this invention. This drawing is a sectional view which fixed the 100 micrometers or less-thick semiconductor chip 4, and the surface of the copper electrode 2 which touches through the rear face and solder 3 of the semiconductor chip 4 serves as convex. As shown in aforementioned drawing 8 , the rear-face metal membranes 102, such as a three-layer vacuum evaporation layer of aluminum/nickel/Au, were formed in the surface of the semiconductor substrate 100 at the insulator layers 101, such as polyimide, and the rear face, and, as for the semiconductor chip 4, the surface has usually curved in convex (it is curving).

1012] The surface of the copper electrode 2 which joins the semiconductor chip 4 which curved in convex [this] with solder 3 is curvated to convex. This curved field is acquired by forming the height 6 in the surface of the insulating substrate 1, and forming the copper electrode 2 of uniform thickness on it. Moreover, this curved field forms the height in the surface of the copper electrode 2 so that the field which curved in the concave of the rear face of the semiconductor chip 4 may be exactly contacted according to the average curvature state of the semiconductor chip 4.

1013] The semiconductor chip 4 which curved is joined through solder 3 along this bow side. Since the state of the surface of the copper electrode 2 which is in the underside side to which the semiconductor chip 4 is joined at this time is made like the state of the curvature of the semiconductor chip 4, At the time of a soldered joint, even if an opening 5 does not arise in the solder 3 which has joined the copper electrode 2 to the semiconductor chip 4 but it performs wire bonding which is not illustrated, the semiconductor chip is not damaged.

1014] Furthermore, since it has joined by the whole surface product of the semiconductor chip 4, a power cycle tolerated dose also improves. After the semiconductor substrate shown in drawing 1 places a daily dose so that the underside used as the pair of the convex configuration of the surface of the insulating substrate 1 may serve as the circuit board of predetermined thickness between these two metal mold in the ceramic powder which is a raw material using two, concave metal mold and metal mold with the even surface, it is calcinated and formed at predetermined pressure and predetermined temperature. Then, the surface puts on the ceramics plate which became a concave, and joins at predetermined pressure and predetermined temperature. Generally an alumina, nitriding aluminum, etc. are used for junction of a ceramics plate and copper foil as a jointing material.

1015] Drawing 2 is the important section sectional view of the semiconductor circuit board of the 2nd example of this invention. The difference from drawing 1 is the point of having formed the height 7 in the surface of the copper electrode 2 which there is no height 6 in the insulating substrate 1 used as a base, and is installed in the upper part. Also in this case, the same effect as drawing 1 is acquired. The semiconductor circuit board shown in drawing 2 creates the ceramics plate with metal mold with even upper surface and underside. upper foil is put on a ceramics plate with this even surface, and a ceramics plate is joined for even metal mold to copper foil at Mr. arrangement, and predetermined pressure and predetermined temperature in another [which does not put copper foil] ceramics plate made from the metal mold side where the concave crater was formed in the field which touches copper foil. By carrying out like this, the copper electrode 2 with a convex configuration is formed.

1016] Drawing 3 is the important section sectional view of the semiconductor circuit board of the 3rd example of this invention. This semiconductor circuit board makes a concave the height 6 of the insulating substrate 1 shown by drawing 1 R> 1, and the copper electrode 2. This is applied when the semiconductor chip 4 has curved in the concave. Also in this case, the same effect as drawing 1 is acquired. The semiconductor circuit board shown in drawing 3 is manufactured because the underside used as the concave shape of the surface of the insulating substrate 1 and a pair uses concave metal mold like the fabrication method of the semiconductor circuit board shown by drawing 1 .

1017] Drawing 4 is the important section sectional view of the semiconductor circuit board of the 4th example of this invention. This semiconductor circuit board makes a concave the height 7 of the copper electrode 2 shown by drawing 2 R> 2. Also in this case, the same effect as drawing 2 is acquired. The semiconductor circuit board shown in drawing 4 is manufactured because the underside used as the convex configuration of the surface of the insulating substrate 1 and a pair uses convex metal mold like the fabrication method of the semiconductor circuit board shown by drawing 2 .

1018] Drawing 5 is the important section sectional view of the semiconductor circuit board of the 5th example of this invention. Although this semiconductor circuit board is the same composition as the semiconductor circuit board of drawing 1 fundamentally, it has stalled the pit 10 (******) which slushes the excessive solder 3a into the periphery section of the part which joins the semiconductor chip 4. As the excessive solder 3a shows in a flash and drawing by a dotted line to the periphery section and the chip surface of the semiconductor chip 4, this pit 10 has the work which prevents connecting too hastily in the periphery section, and can rise reliability.

1019] Although installed in the periphery section of the part which joins the semiconductor chip 4, this pit 10 designs the size of its depth and width so that the solder which it was various and was protruded with the amount of the surface area and the solder of the semiconductor chip 4 may not overflow from a pit 10. Moreover, this pit 10 may be established only in the surface of the copper

electrode 2, and if a still deeper pit is required, it will not matter as illustrated, even if it reaches to the insulating substrate 1 located in the lower part of the copper electrode 2.

D20] Moreover, this pit is preparing also in drawing 4 from drawing 2, and the same effect is acquired.

D21] Effect of the Invention] According to this invention, according to the curvature of a semiconductor chip, incurvate a copper electrode, opening becomes impossible between a semiconductor chip and solder by joining by solder, and breakage to a semiconductor chip can be prevented with the welding pressure at the time of wirebonding. Moreover, since there is no opening, thermal resistance does not increase but a power cycle tolerated dose improves.

D22] Furthermore, by installing the pit which slushes surplus solder into the copper electrode or copper electrode which joins a semiconductor chip, and an insulating substrate, the tolerated dose to the thermal stress at the time of chip operation can improve, and the joining reliability can be acquired.

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EUROPEAN PATENT OFFICE

Patent Abstracts of Japan

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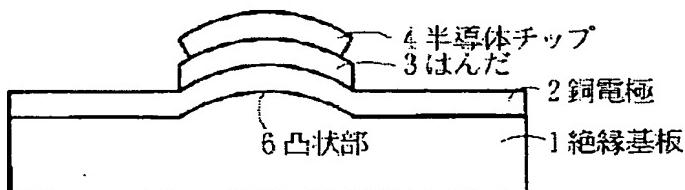
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APPLICANT : FUJI ELECTRIC CO LTD;

INVENTOR : YOSHIHARA KATSUHIKO;

INT.CL. : H01L 23/12 H01L 21/52

TITLE : SEMICONDUCTOR CIRCUIT BOARD
AND SEMICONDUCTOR DEVICE



ABSTRACT : PROBLEM TO BE SOLVED: To provide a semiconductor circuit board which allows the firm fixation of a thin semiconductor chip to itself without damaging the semiconductor chip.

SOLUTION: On the surface of a copper electrode 2 of a semiconductor circuit board, a projecting section 6 is formed which is consistent in shape with a rear face of a thin semiconductor chip 4 whose surface is warped upwards. By fastening the rear face of the semiconductor chip 4 to the projecting section 6 via solder 3, the solder can be free of void and the semiconductor chip 4 is never damaged by a pressurizing force applied at the time of bonding. Furthermore, there is no increase in heat resistance which could be caused by the void of the solder, and the resistance to a power cycle of the semiconductor chip 4 can also be improved.

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